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Observations on the Psoas Parvus and Pyramidalis. A Study of Variation.

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(Read before the American Philosophical Society, March 17, 1893.)

The only anatomist who has made observations as to the presence or absence of the psoas parvus on a really large scale is the late Prof. Gruber, of St. Petersburg. After him, at a considerable interval, comes Mr. Hallet, and again, at an interval, Mr. Perrin. So far as I am aware no other anatomist has published observations sufficiently numerous to discuss.* As evidence that this deficiency really exists, I may refer to the zeal with which Theile's results on 20 bodies are quoted.

Perrin† found the psoas parvus in 32 of 112 subjects. Of these 32, 21 were males and 11 females. He states that the sexes were about evenly divided in the whole number examined. He gives no details as to the occurrence of the muscle on one or both sides.

Hallet‡ gives the results of two years' observations in the dissecting room at Edinburgh, on about one hundred subjects each year. In his first set of observations the psoas parvus was more frequently present than absent, 61 to 54, and this proportion was preserved throughout the second hundred subjects. He remarks that when it is present it is most frequently found on one side, and that the right one. "In the first hundred subjects dissected it was found as often deficient in the female as in the male, but in the second hundred it was more frequently present in the proportion of seven to six."

We come now to the only satisfactory statistics, those of Gruber.§ He gives first a series of observations of both sides of 450 bodies, of which 300 were male and 150 female. He made later observations for a particular purpose on 300 subjects in which the sexes were equally divided. The close correspondence between these two series is very remarkable.

FIRST SERIES.

	300 MALE.	150 FEMALE.	450 OF BOTH SEXES.
Present on both sides. . . .	142 = 47.3 %	56 = 37.3 %	198 = 44 %
Present on neither side. . .	111 = 37	72 = 48	183 = 40.6
Present on right side	} 47 = 15.7	} 22 = 14.7	} 69 = 15.4
only. 22			
Present on left side	} 47 = 15.7	} 22 = 14.7	} 69 = 15.4
only. 25			
		11	36

* This paper was read December 23, 1892, at the meeting of the Association of American Anatomists at Princeton. The context will show that one addition has been made since the reading.

† *Medical Times and Gazette*, 1872.

‡ *Edinburgh Medical and Surgical Journal*, 1848, Vol. i, and 1849, Vol. ii.

§ *Beobachtungen aus der menschlichen und vergleichenden Anatomie*, Heft 1, 1879. I have transposed Gruber's figures so as to show the presence rather than the absence of the muscle, and have substituted percentages for his rather crude proportions.

SECOND SERIES.

	150 MALE.	150 FEMALE.	300 OF BOTH SEXES.
Present on both sides.....	70 = 46.6 %	59 = 39.3 %	129 = 43 %
Present on neither side....	56 = 37.3	69 = 46	125 = 41.6
Present on right side	} 24 = 16.1	} 22 = 14.7	} 46 = 15.4
only.....			
Present on left side			
only.....	13	12	25

The percentages are so nearly alike that there is no occasion to combine the series. The subjects came from all parts of Russia, and were mostly Slaves. The following results are self-evident: 1. That, at least on one side, the muscle is more frequently present than wanting, although in more than half the cases it is wanting on at least one side. 2. That it is more common in man than woman. 3. That the two sides are alike very much more often than unlike. This is directly contradictory of Hallet's results. 4. That practically it is found as often on one side as on the other.

Since this paper was first read the report of the Committee of Collective Investigation of the Anatomical Society of Great Britain and Ireland has appeared.* It shows that 457 bodies were examined and that the muscle was wanting in 270 (59 per cent.), that it was present on both sides in 139 (30 per cent.), on one side in 48 (11 per cent.). It was found only on the right side 27 times against 21 on the left. It was therefore more often wanting than present. The sex was stated only in 174 instances. Both muscles were wanting in 54 per cent. of the males, and in 65 per cent. of the females.

The observations about to be reported were made at the Harvard Medical School. Those on negroes are not included in any series. As it often happened that the observation on one side of a subject had been neglected, or for some reason had to be discarded, I give first a series of observations in which only the number of sides of bodies is considered. It comprises 608 sides, divided into 299 right sides and 309 left sides, and also by the sexes. It shows that considering sides only, the muscle is more often wanting than present; that it is more common in man than in woman, and that there is little difference between the sides.

FREQUENCY OF PSOAS PARVUS IN 608 SIDES.

	RIGHT.	LEFT.	TOTAL.
<i>Male</i>Present	89	88	177
Wanting	102	121	223
Total.....	191	209	400
Per cent. present.....	46.5	42.1	44.2

* *Journal of Anat. and Phys.*, Vol. xxvii, January, 1893.

	RIGHT.	LEFT.	TOTAL.
<i>Female</i>Present	33	30	63
Wanting	75	70	145
Total.....	108	100	208
Per cent. present....	30.5	30	30.2
<i>Both Sexes</i>Present	122	118	240
Wanting	177	191	368
Total.....	299	309	608
Per cent. present....	40.8	38.1	39.4

The next table shows the results of observations on both sides of two hundred and fifty subjects.

PSOAS PARVUS. RECORDS OF BOTH SIDES OF 250 SUBJECTS, 165 MALE, 85 FEMALE.

	MALE.	FEMALE.	BOTH SEXES.
Present on both sides.....	60 = 36.3 %	20 = 23.5 %	80 = 32 %
Present on neither side....	84 = 50.9	53 = 62.3	137 = 54.8
Present on right side only.....	14	5	19
Present on left side only.....	7	7	14
Total.....	165 = 99.9	85 = 99.9	250 = 100.0

This shows the muscle decidedly less frequent than Gruber found it, and a little more frequent than would appear from the English observations; thus suggesting the influence of race.

In order to study the relative variability of muscles, to ascertain whether the presence of one occasional muscle renders the presence of another more probable, the pyramidalis was chosen as a starting point. It was chosen because it is generally held that while it is present in a large majority of instances it is not uncommonly wanting. Though this impression is, I believe, general, there is, so far as I know, no large series of observations on the pyramidalis excepting Hallet's. In his two hundred subjects he found it wanting in the proportion of once in nine or ten.* In the following table of observations at the Harvard Medical School, individual sides only are considered.

PYRAMIDALIS IN 673 SIDES.

	RIGHT.	LEFT.	TOTAL.
<i>Male</i>Present.....	180	189	369
Wanting	45	36	81
Total.....	225	225	450
Per cent. present....	80	84	82

* *Loc. cit.* It is worthy of notice that in his first hundred it was wanting once in every three subjects, and once in every fifteen in his second hundred.

	RIGHT.	LEFT.	TOTAL.
<i>Female</i>Present.....	80	83	163
Wanting.....	34	26	60
	<hr/>	<hr/>	<hr/>
Total.....	114	109	223
Per cent. present.....	71	76.1	73
 <i>Both Sexes</i>Present.....	 260	 272	 532
Wanting.....	79	62	141
	<hr/>	<hr/>	<hr/>
Total.....	339	334	673
Per cent. present.....	76.6	81.4	79

The above table of sides only shows the muscle present only in 82 per cent. of the male sides, in 73 per cent. of the female, and in 79 per cent. of those of both sexes, which, however, were unequal. It was somewhat more common on the left.

The next table shows the results in the same series of two hundred and fifty subjects which was used for the *psoas parvus*.

PYRAMIDALIS RECORDS OF BOTH SIDES IN 250 SUBJECTS, OF WHICH
165 WERE MALE AND 85 FEMALE.

	MALE.	FEMALE.	BOTH SEXES.
Present on both sides.....	125 = 75.6%	58 = 68.1%	183 = 73.2%
Present on neither side...	25 = 15.1	22 = 25.9	47 = 18.8
Present on right side only.....	5	0	5
Present on left side only.....	10	5	15
	<hr/>	<hr/>	<hr/>
Total.....	165 = 99.7	85 = 99.8	250 = 100.0

This shows, in addition to what was shown by the preceding table, that the two sides were alike in 92 per cent.

We must now subdivide this series into smaller groups according to the presence or absence of *pyramidalis* and *psoas parvus* considered collectively.

RECORDS OF BOTH MUSCLES ON BOTH SIDES IN 250 CASES, OF WHICH
165 WERE MALE AND 85 WERE FEMALE.

GROUP.	SEX.	NUMBER.	PER CENT.
A.			
Pyramidalis and <i>psoas parvus</i> on both sides.	Male.....	48	29
	Female.....	16	18.8
	Both sexes.....	64	25.6

GROUP.	SEX.	NUMBER.	PER CENT.
B. Pyramidalis on both sides. Psoas par- vus on one side.	Male.....	18	10.9
	Female.....	9	10.5
	—	—	—
	Both sexes.....	27	10.8
C. Pyramidalis on both sides. No psoas parvus.	Male.....	59	35.7
	Female.....	33	33.8
	—	—	—
	Both sexes.....	92	36.8
D. Pyramidalis on one side. Psoas par- vus on both sides.	Male.....	4	2.4
	Female.....	0	0
	—	—	—
	Both sexes.....	4	2.4
E. Pyramidalis on one side. Psoas parvus on one side.	Male.....	1	.6
	Female.....	1	1.1
	—	—	—
	Both sexes.....	2	.8
F. Pyramidalis on one side. No psoas parvus.	Male.....	10	6
	Female.....	4	4.7
	—	—	—
	Both sexes.....	14	5.6
G. No pyramidalis. Psoas parvus on both sides.	Male.....	8	4.8
	Female.....	4	4.7
	—	—	—
	Both sexes.....	12	4.8
H. No pyramidalis. Psoas parvus on one side.	Male.....	2	1.2
	Female.....	2	2.3
	—	—	—
	Both sexes.....	4	1.6
I. No pyramidalis. No psoas parvus.	Male.....	15	9.6
	Female.....	16	18.8
	—	—	—
	Both sexes.....	31	12.4

These tables show, as would naturally be expected, that the largest group (C) is that of two pyramidales and no psoas, and that this is the largest in either sex. For the next largest groups we have to examine the sexes separately, for we find that 29 per cent. of the men (A) have all four muscles, while precisely an equal number of women (18.8 per cent.) (A

and I) have all four, and none of the four. Only 9.6 (I) per cent. of the men have all four wanting.

By way of a more exact method of determining what relation there may be between the presence or absence of one muscle and that of the other, I have put together all the cases of presence of both pyramidales, groups A, B and C, into one series, and reckoned the percentages of instances of a *psoas parvus* on both sides and on neither side, to compare them with the percentages of the normal series.

We find 125 men and 58 women, 183 in all, having both pyramidales; of these 48 men and 16 women have the *psoas parvus* on both sides. Calculating the percentages we find that 38.4 per cent. of these men, 27.6 of the women and 34.9 of the whole, have the *psoas parvus* on both sides, against 36.3, 23.5 and 32 respectively as percentages of the whole series of 250. We find, therefore, that a subject with two pyramidales is a little more likely to have the *psoas* on both sides than one which has not. The next step is to take as a basis the cases of no pyramidalis, and to find whether in them the percentage of *psoas parvus* on both sides is different from that of the entire series. We find that 25 men and 22 women, 47 in all, had no pyramidalis; of these, 8 men and 4 women, 12 in all, had the *psoas parvus* on both sides, giving percentages of 32, 18.4 and 25.5 respectively, against 36.3, 23.5 and 32 in the entire series, showing that subjects with no pyramidales are less likely to have the *psoas parvus* on both sides than others. Thus we seem to have found a tendency, though a slight one, in variations by excess and variations by defect to go together respectively.

By way of further comparison I have counted the number in these 250 subjects in which the *palmaris longus* was known to be absent on both sides. I find this is recorded in 21 cases, and very probably occurred in some others. Let us see whether in these 21 cases there was a more frequent deficiency of either pyramidalis or *psoas* minor than one would expect. We find nothing of the kind. As for the pyramidalis we find it was wanting in three cases only on both sides and once on one side. The *psoas parvus* was present on both sides seven times, almost precisely the percentage of the series of 250.

Finally I found among these 250 cases, 12 in which a *sternalis* was present on one or both sides (twice on both sides and ten times on one). This is what may be called an anomaly by excess. Let us see whether the series of subjects presenting it was marked by more than ordinary frequency of the pyramidalis and *psoas parvus*. The result is certainly remarkable, for it is the very reverse of what might be expected. In these 12 the pyramidalis was wanting on both sides in 4, and on one side in 3, leaving it therefore present on both sides in only 5. The *psoas parvus* was more normal, being present on both sides in 5, on one side in 1, and wanting in 6. If we take these two muscles together we find that both were absent on both sides 3 times, a percentage of 25, which is about twice that in the entire series. It cannot be denied that this series of twelve

subjects with sternalis is too small, and yet there is some reason to think that a larger series would give the same result only more strikingly. Thus there are three other cases of sternalis which could not be included, because in each the record of one psoas was wanting. The first had 2 pyramidales, one psoas was wanting, the other unaccounted for; in the second and third both pyramidales and the recorded psoas were wanting. As we have found that the two sides generally agree it is probable that the unrecorded psoas was in all these instances wanting. In any case if these could have been added to the series they would materially have diminished the frequency of psoas parvus and pyramidalis when the sternalis was present. The criticism may be made that the sternalis should not be reckoned as an instance of excessive differentiation, for it is found with abnormal frequency in anencephalous fetuses and there is reason in some cases at least to look upon it as a displacement of some fibres of the pectoralis major. It is to be remarked, however, that it is in these monsters, rather than in adults, that the deficiency of the pectoral is common. No one would think of including them in a series for the study of the frequency of variations. In normal bodies the sternalis may, I think, be called an anomaly by excess.

These two sets of cases, namely those of absence of the palmaris longus and presence of the sternalis, the latter especially, tend to disagree with the conclusions reached on the series of the psoas parvus and pyramidalis. None the less I am disposed to allow the series of psoas and pyramidalis a certain weight. But granting that there is a tendency for variations by excess and deficiency to go together respectively, the fact seems to be that the tendency is a slight one and that probably the cause, whatever it may be, that determines the differentiation of muscles must be considered as acting in most cases on each independently of the others.

Again the only large series of observations bearing on this point is by Gruber. It deals with the psoas parvus, the palmaris longus, and the plantaris of 300 subjects equally divided between the sexes. His system of tabulation is not easy nor altogether satisfactory. He discusses the relative frequency of defect of these muscles, but apparently from rather a different standpoint. In no case were all three muscles wanting on both sides. In three cases only were two of them wanting in both sides and one on one side. Absence of palmaris and plantaris in the same subject was also very uncommon. In two cases both palmares and one plantaris were wanting. In no case, apparently, were both wanting on both sides.